The Impact of Private and Public R&D on Industry Productivity

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In the early 1980s, developments in federal innovation policy sought to maximize the returns to the government's substantial investment. Legislation such as Bayh-Dole in 1980 and the creation of the Small Business Innovation Research Program in 1982, encouraged the private-sector commercialization of technologies developed through federal contract R&D. These and subsequent programs have allowed and encouraged firms to utilize technology developed through federal R&D contracts to create new commercial products. This paper addresses the question: have these programs been successful in encouraging the transfer of technology created from federal R&D contracts to marketable output? It examines the impact of federal R&D investment on the creation of private R&D and commercial output in six high-tech industries.

This paper develops a model of an industry's production of three goods: commercial output, private R&D, and public R&D. Each production process is interrelated allowing private and public R&D to impact the usage of capital, labor, and materials in the commercial output production function. The three functions are estimated over the period 1959-1998 for six high-high tech industries: chemicals, fabricated metal, industrial machinery, electrical equipment, transportation and scientific instruments. The six industries account for 87% of all business R&D investment and 97% of federal R&D investment in the manufacturing sector.

The rates of return to both private and public R&D investment calculated over the entire period. Industries received an average gross rate of return of 30% to their own R&D investment. This suggests that the industries have been successful at choosing R&D projects that will create new products or improve the efficiency of their production process. The returns to public R&D received by industry are in decline over the first half of the period, but increase after the implementation of technology transfer policy. By the 1990s, the average return to public R&D performance is 17%. Public federal R&D now has a positive impact on commercial output of industries in the manufacturing sector.

This paper finds that technology transfer policy has had an effect on industry R&D performance and production. The positive rates of return show that industry has been successful in commercializing the technologies developed using federal R&D funds. Policymakers should continue to support technology transfer policy because it is has been successful in expanding the benefits of federal research projects and introducing new technology into the marketplace.

Figure 1. Private and Public Returns to Manufacturing R&D